Detection of Metal in LabVIEW using Vision Assistant

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Abstract

Robot is a machine that is specially programmed by a user or computer. Robot is mainly used for carrying things with complex action and it can be guided by external control device. The article states that detecting a small pieces that we are using in daily life. This can be done in NI-Vision Development Module. The metal detection can be carried out in by gesture movement of the user the robot is controlled. The gesture movement is given by using ADXL335 which is programmed with Arduino. The robot is controlled in LabVIEW by interfacing Arduino and LabVIEW through VI Package Manager. By giving instructions via ADXL335 the robot is controlled and by in the travelling path of robot if any small pieces is detected and it is identified.
Keywords- ADXL335, Arduino, Vision Assistant, myRIO

I. INTRODUCTION

In the emergent technology robotics is majorly used in all fields like automation, military and in surveillance purpose. Robots is majorly classified into autonomous or semi-autonomous. It can be deal with technology based on design, construction, and operation. It can be of wireless or wired. But both required controller. To control the robot in desired direction they are some of the methods are available like switch, voice etc.

One of the method is used in recent years is gesture based controlling of robot. This helps the user to control the robot in natural way and it provides interaction with human and robot. Now a day's wireless robot is used and it has large amount of scope and used to develop variety of applications. By dealing with gesture control robot, makes wireless transmission is helpful in easier interaction with robot.

Basically gesture is a term that controlling the robot with human hand movement. In this article described that interfacing of LabVIEW and Arduino. With help of these two software platforms the robot is being controlled.

II. HARDWARE TOOLS

The Hardware components are listed below
1) Arduino UNO
2) MyRIO

A. Arduino UNO

The Arduino Uno is a microcontroller board based on the ATmega328(datasheet).It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16MHz ceramic resonator, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller, simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started.

B. myRIO

The myRIO 1900 is a tool you can use to teach and implement multiple design concepts with one reconfigurable I/O (RIO) device. Featuring I/O on both sides of the device in the form of MXP and MSP connectors, it includes 10 analog inputs, six analog outputs, 40 digital I/O lines, Wi-Fi, LEDs, a push button, an onboard accelerometer, a Xilinx FPGA, and a dual-core ARM Cortex A9

processor. You can program the myRIO 1900 with LabVIEW or C. This Wi-Fi enabled version allows for fast and easy integration into remote embedded applications.

An FPGA is comprised of logic units, memory and other fundamental building blocks that may be reconfigured at the hardware level. An FPGA can implement hardware peripheral such as communication buses, PWM generators, quadrature encoder interfaces, signal processing algorithms, video rendering and decoding, and even other processor architectures.

III. SOFTWARE TOOLS

A. Arduino

There are number of IDEs (Integrated Development Environment) available. Among them one of the IDE is Arduino. Arduino is open source Arduino Software (IDE) makes it easy to write code and upload it to the board. It runs on Windows,Mac and Linux. The environment is written in Java and based on processing and other open source software. Arduino IDE has some features that are listed below:

- Inexpensive-Arduino boards are relatively inexpensive compared to other microcontroller platforms.
- Cross-Platform-The Arduino IDE runs on Mac, Windows, and Linux OS.
- Open-Source and extensible Software-The Arduino software is published as open source tools.

B. LabVIEW

LabVIEW is an Intergrated development environment designed specifically for engineers and scientists building measurement and control systems. With a native graphical programming language, built-in IP for data analysis and signal Processing, and an open architecture that enables integration of any hardware device and any software approach,LabVIEW is the software you need to build the optimal solution that can meet your custom requirements and solve the challenges at hand. The programming language used in LabVIEW, named G, is a dataflow programming. Execution is determined by the structure of a graphical block diagram on which programmer connects different function nodes by drawing wires.

LabVIEW includes extensive support for interfacing to devices, instruments, cameras and other devices. Users interface to hardware by either writing direct bus commands (USB, GPIB, and Serial) that provides native LabVIEW function nodes for controlling the device.

1) Vision Development Module

The Vision Development module is designed to help you develop and deploy machine vision applications. It includes lot of functions to acquire images from a multimode of cameras and to process images by enhancing them, checking for presence, locating features, identifying objects and measuring objects. The purpose of Vision Development Module is

1) Acquire and process images with a wide range of cameras and vision hardware to reduce development time.
2) Process images with a complete suite of applications.
3) Integrating with PLC, Motion Drivers and Automation Devices.

IV. IMPLEMENTATION

A. NI-Vision Acquisition

It is one of the software to Acquire, Save and Display Images.Acquring and saving the images from different cameras. In Vision acquisition express it has some steps as follows as

1) Launch LabVIEW and create a new project.
2) Add a remote target to the project.
3) Right-click the target. Select New»VI. This opens a new VI and adds it under the remote target to the project.
4) Right-click the block diagram of the new VI to display the Functions Palette. Select Vision and Motion»Vision Express»Vision Acquisition Express VI and drag it to the block diagram. This launches the NI Vision Acquisition Express Wizard.
5) All the devices connected to the remote target appear in the list of devices in the Acquisition Sources control on the NI Vision Acquisition Express Wizard.
6) Select your device from the list of available devices in the Acquisition Sources control.
7) Click Next.

B. NI-Vision Assistant

After acquiring the image we have to process the image so we need to use Vision Assistant. This palette groups several functions that analyze the content of an image to obtain information you specify. This palette also contains functions you can use to modify the geometry of the image, calibrate the image so you can make measurements in real-world units, and correct the image.

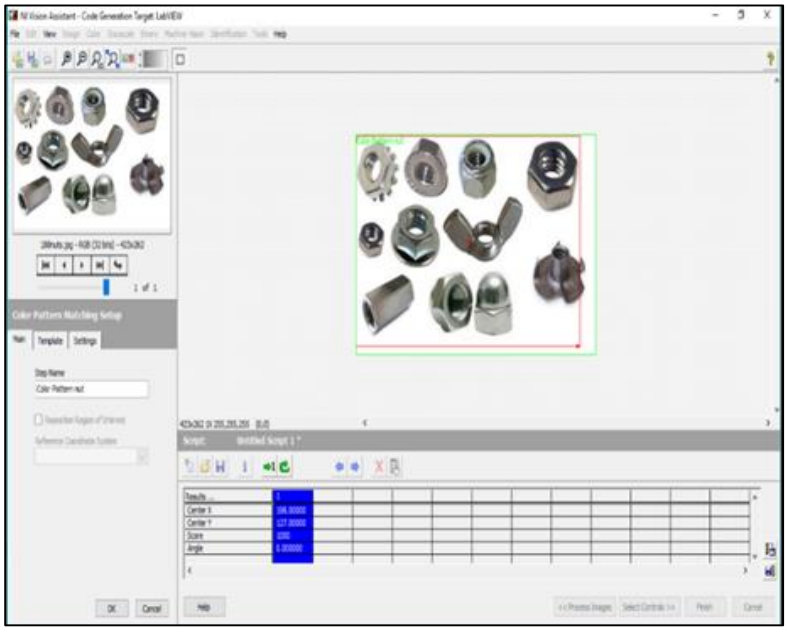

Fig. 1: Vision Assistant

The above Figure 2. Shows that acquiring a image in either camera or browse the image. In the vision development module we can acquire the image via USB camera or directly browse the image that is present in our computer .After getting the image process the image based on our requirement. For example the process the image like colour matching, pattern matching. For matching any character we can go for OCR.OCR represents that Optical Character Recognition. It is like to match the each character. After processing the image we have to choose the controls and indicators based on our requirement and VI is built on it.

V. RESULT AND CONCLUSION

The Figure 2. Shows that block diagram VI for metal detection. In the vision acquisition the image is getting acquired the metal through camera. In the vision assistant part we match the pattern of the metal (i.e. Pattern Matching) and based on Hue value of the particular metal. If the image is acquiring from camera is matches with detected metal it indicates the how many metals are matched. Otherwise it matches based on the hue value of the metal. Because each metal has different hue value, so we match the hue value ±10.If it matches means it shows that how many metals are matched.

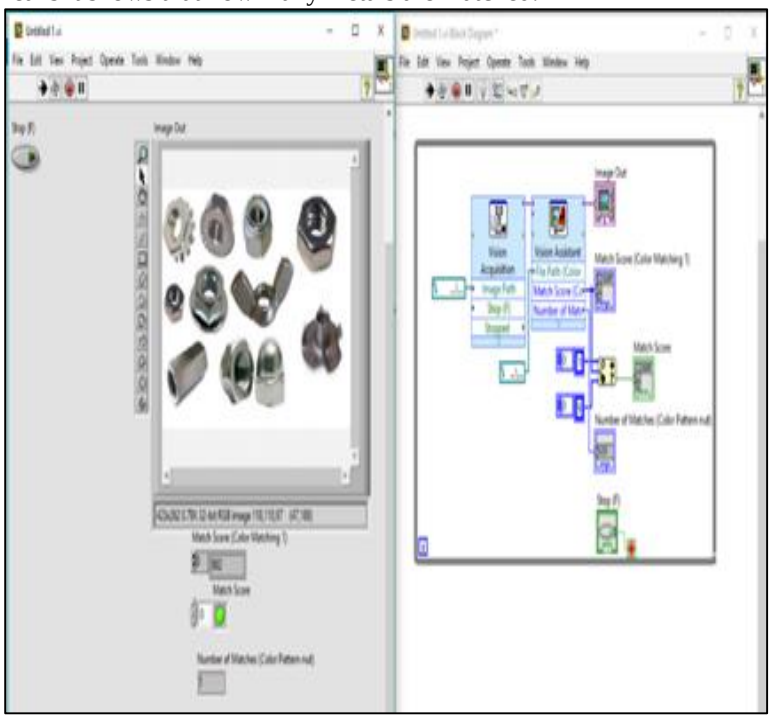

Fig. 2: Metal Detection VI

By detecting the metal it is able to find the type of metal also it is useful because we are connecting robot with wireless so we can travel around 10-20m so we can detect the metal in distance. The input to the robot is given through ADXL335 and motor is controlled through myRIO.By travelling path of the robot detects any metal and it identified.

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